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Hazmat Freight and Supply Chains

National Hazardous Material Freight Transportation

presented to

FHWA Talking Freight Webinar Series

presented by

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Presentation Outline

- Hazmat and Dangerous Goods 101
- Hazmat Regulations and Oversight
- The U.S. Energy Revolution: What it Means for Hazmat Transportation Infrastructure
- Selected Hazmat Supply Chains

Hazardous Materials, Dangerous Goods

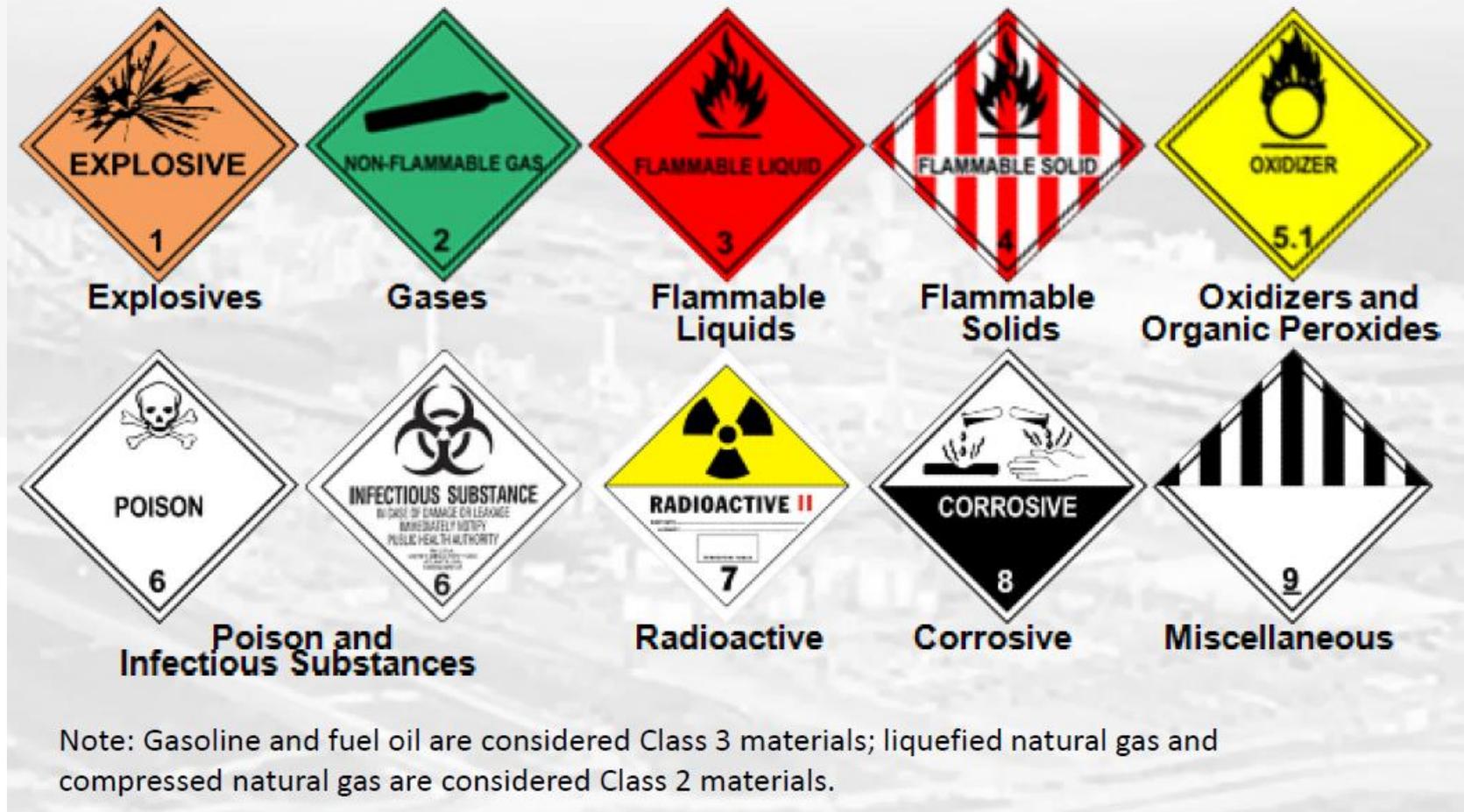
A substance or material, that when transported in commerce, is capable of posing an unreasonable risk to:

- Health
- Safety
- Property
- Environment



- **Dangerous goods:** Many products pose some danger while being transported, but dangerous goods are generally products that are inherently dangerous whether or not they are in transport (Transport Canada). They include “articles or materials capable of posing significant risk to people, health, property or the environment when transported in quantity” (United Nations).

Hazmat Classification



Source: Emergency Response Guidebook, 2016

Hazmat Freight Shipments in the U.S.

- Up to one million shipments daily
- 2.2 billion tons shipped annually by all modes
- 12% of all freight tonnage shipped annually



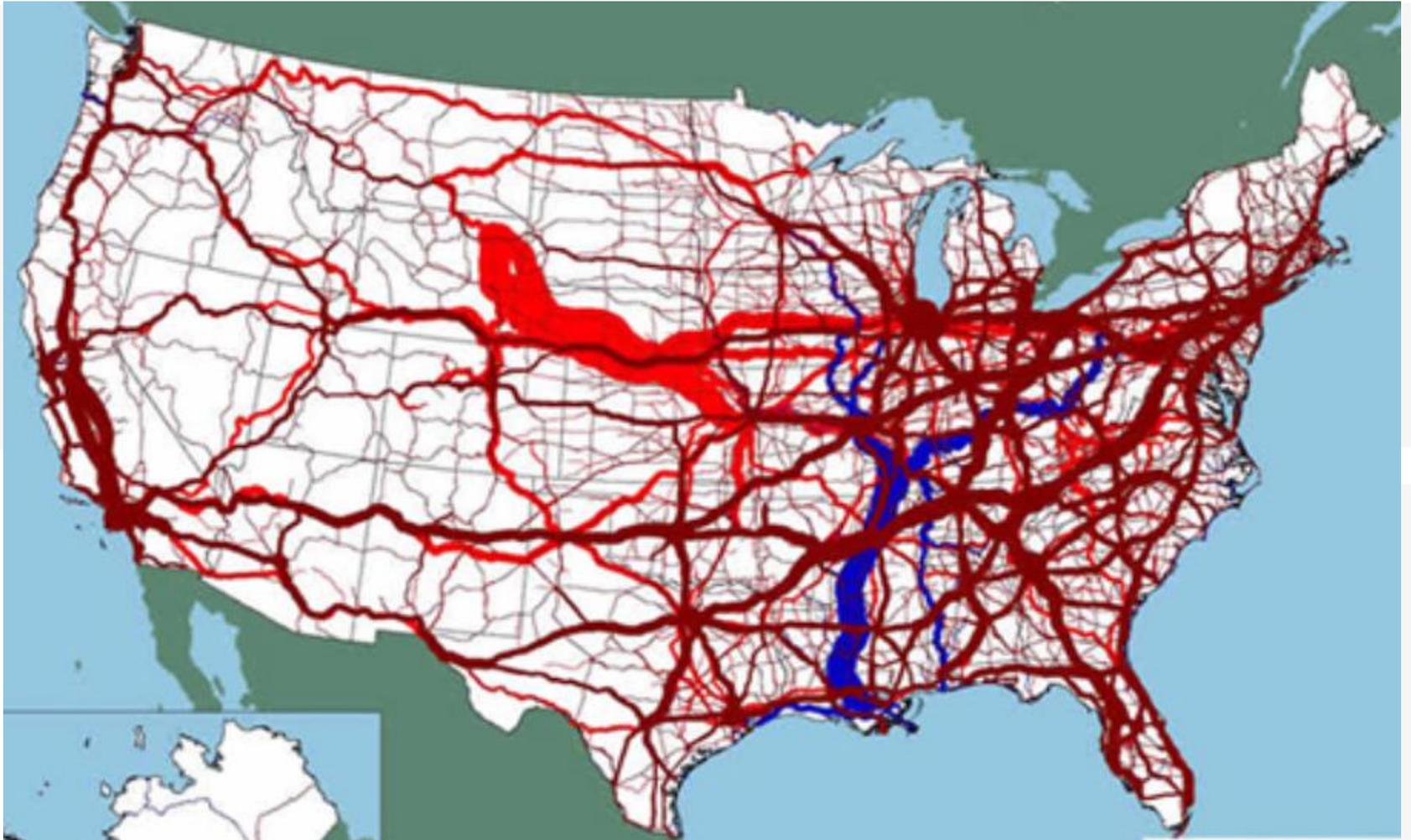
Source: USDOT

Daily Hazmat Transport in the US

- **Chemicals** are used every day by industries to ensure the safety of our water and food supply (ACC).
- From **Chlorine** to **Crude oil**, America's freight railroads transport essential hazardous materials, 99.999% of which reach their destination without a release caused by an incident (AAR).
- **Petroleum products** fuel our nation's growing economy and are transported across the US every day (API)
- **Ethanol** has become the largest biofuel transported by rail and an important US export (RFA)
- **Natural Gas** is now exported from the US more than imported (EIA).

Sources: Industry and Agency Web Sites

U.S. Freight Flows, 12% is Hazmat



Source: FHWA

Hazmat Regulations

49 CFR 171 through 180

- 171 General information, regulations, and definitions
- 172 Hazardous materials table, special provisions, hazmat communications, emergency response, training
- 173 Shippers and packaging
- 174 Carriage by rail
- 175 Carriage by aircraft
- 176 Carriage by vessel
- 177 Carriage by public highway
- 178 Specs for packaging
- 179 Specs for tank cars
- 180 Continuing qualification and maintenance of packagings



Source: PHMSA, USDOT, 2018

Federal Hazmat Regulatory Oversight

ATF	Transportation of explosives
DOD	Military shipments of munitions, fuel
EPA	Facilities storing hazmat
FAA	Hazmat by air
FERC	Facility siting, interstate commerce
FMCSA	Cargo tanks, carrier oversight
FRA	Shippers, carriers, track inspections
OSHA	Worker health and safety
PHMSA	Hazmat handling and packaging
STB	Commercial hazmat transportation
USCG	Facility and Vessel Inspections

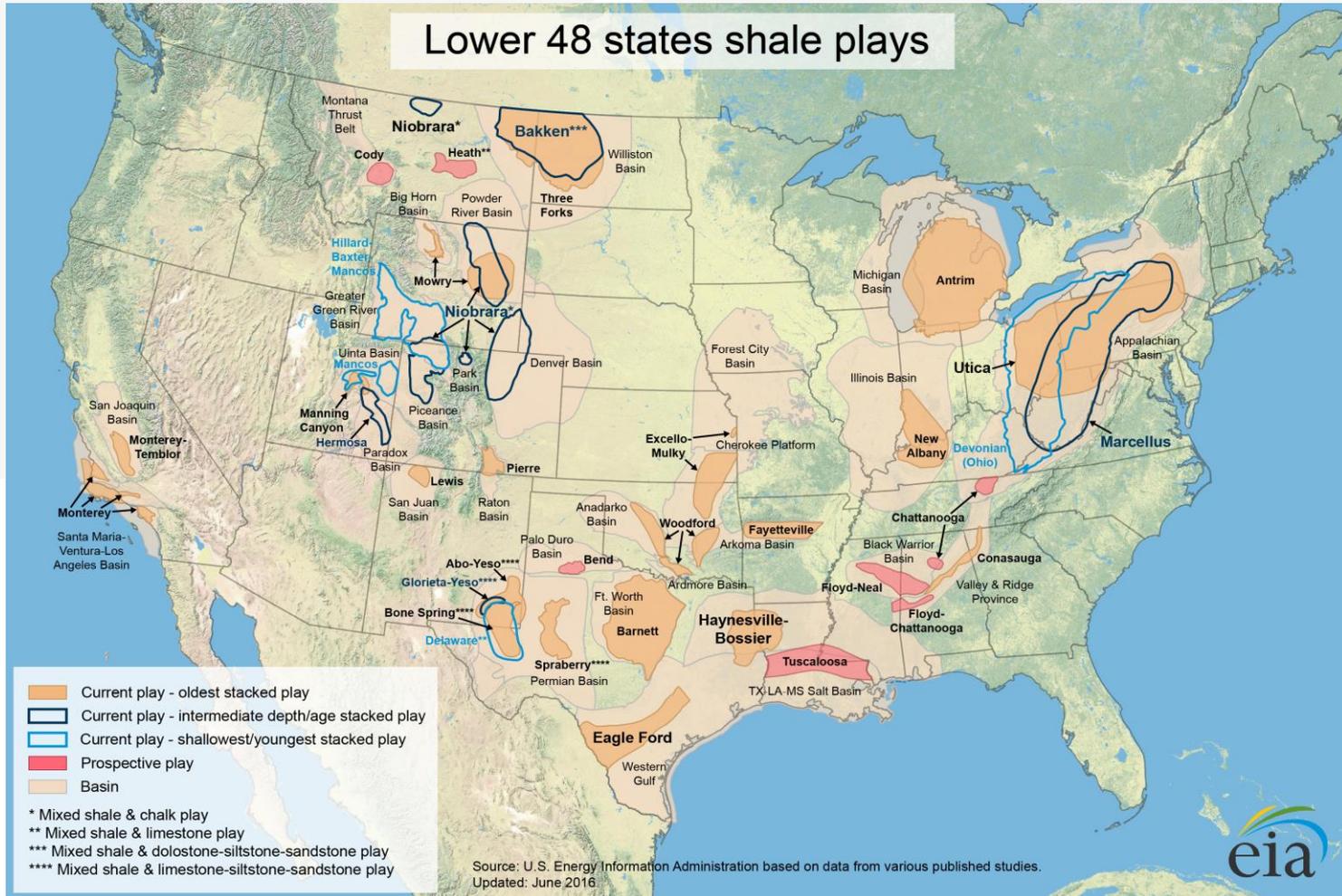
Sources, CS, Agency Web Sites

Hazmat Emergency Preparedness

- Following several industrial accidents in the 1980s, Congress passed the Emergency Planning and Community Right-to-know Act (EPCRA), including the formation of Statewide Emergency Response Commissions (SERCs), Tribal Emergency Response Commissions (TERCs) and Local Emergency Planning Committees (LEPCs).
- LEPCs are required to develop and test emergency response plans annually and provide chemical information to citizens.

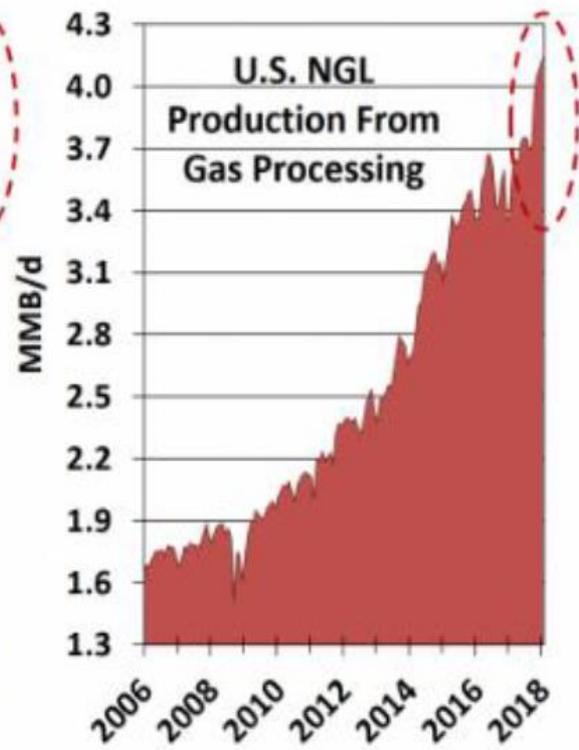
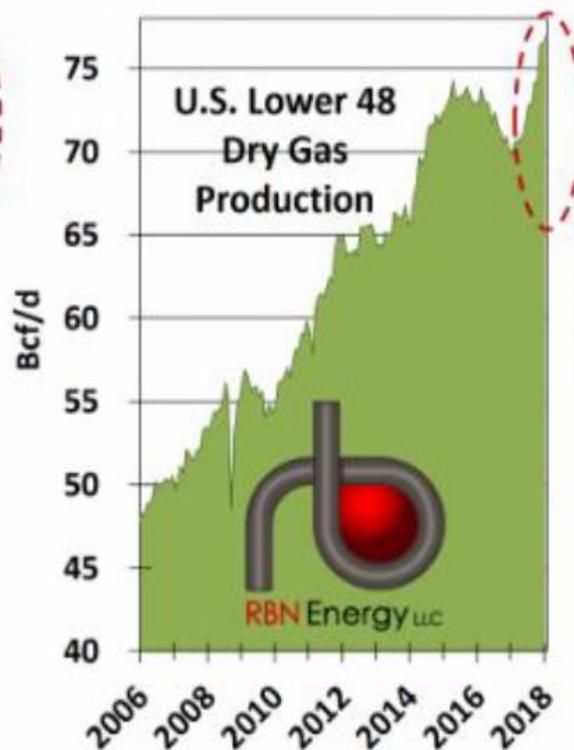
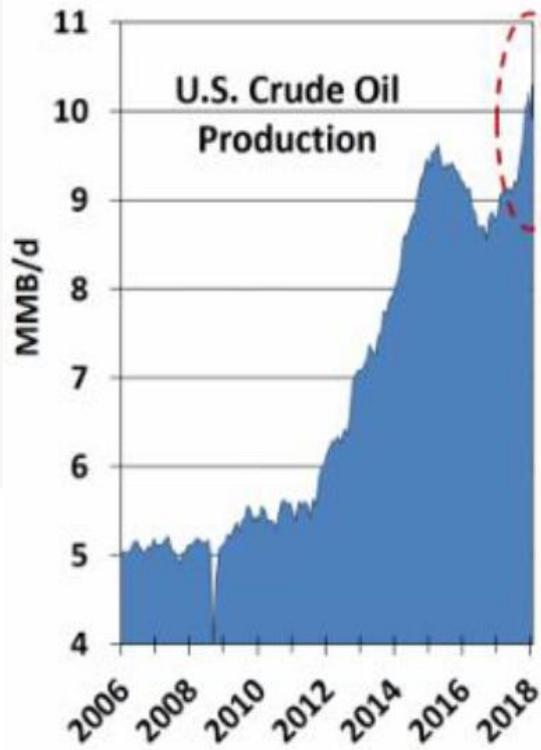
Source: US EPA

US Oil and Gas Shale Plays



Source: EIA

U.S. Hydrocarbon Production Trends



Sources: EIA and RBN Energy

Shale Oil and Gas Supply Chains

Crude Oil



Refined
Products
& Feedstock



Domestic and
Export volumes

Natural Gas + NGLs



Methane
Gas



LNG Exports



Propane
Butane
Ethane

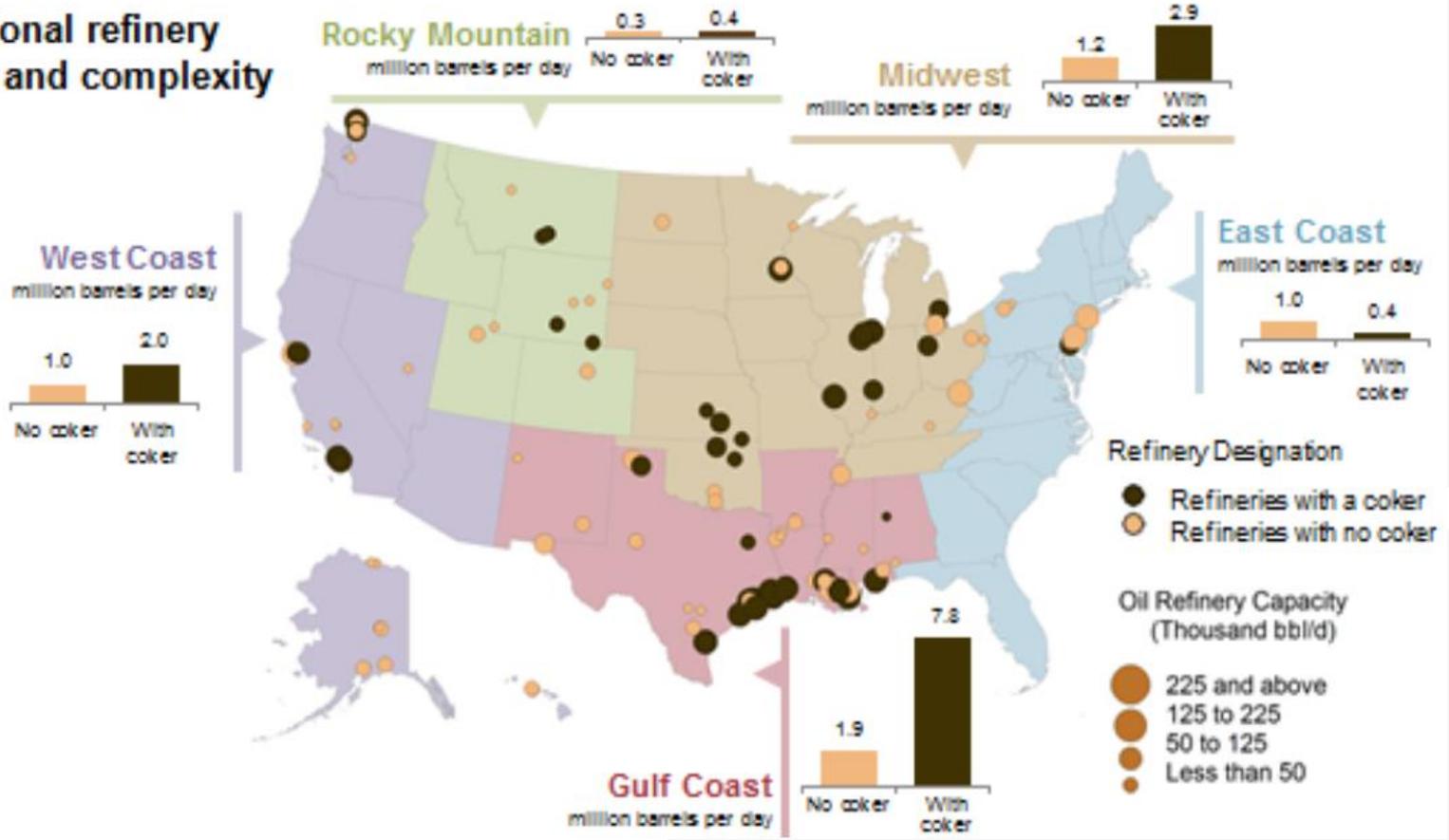


Ethylene:
Chemical
Feedstock

Source: CS

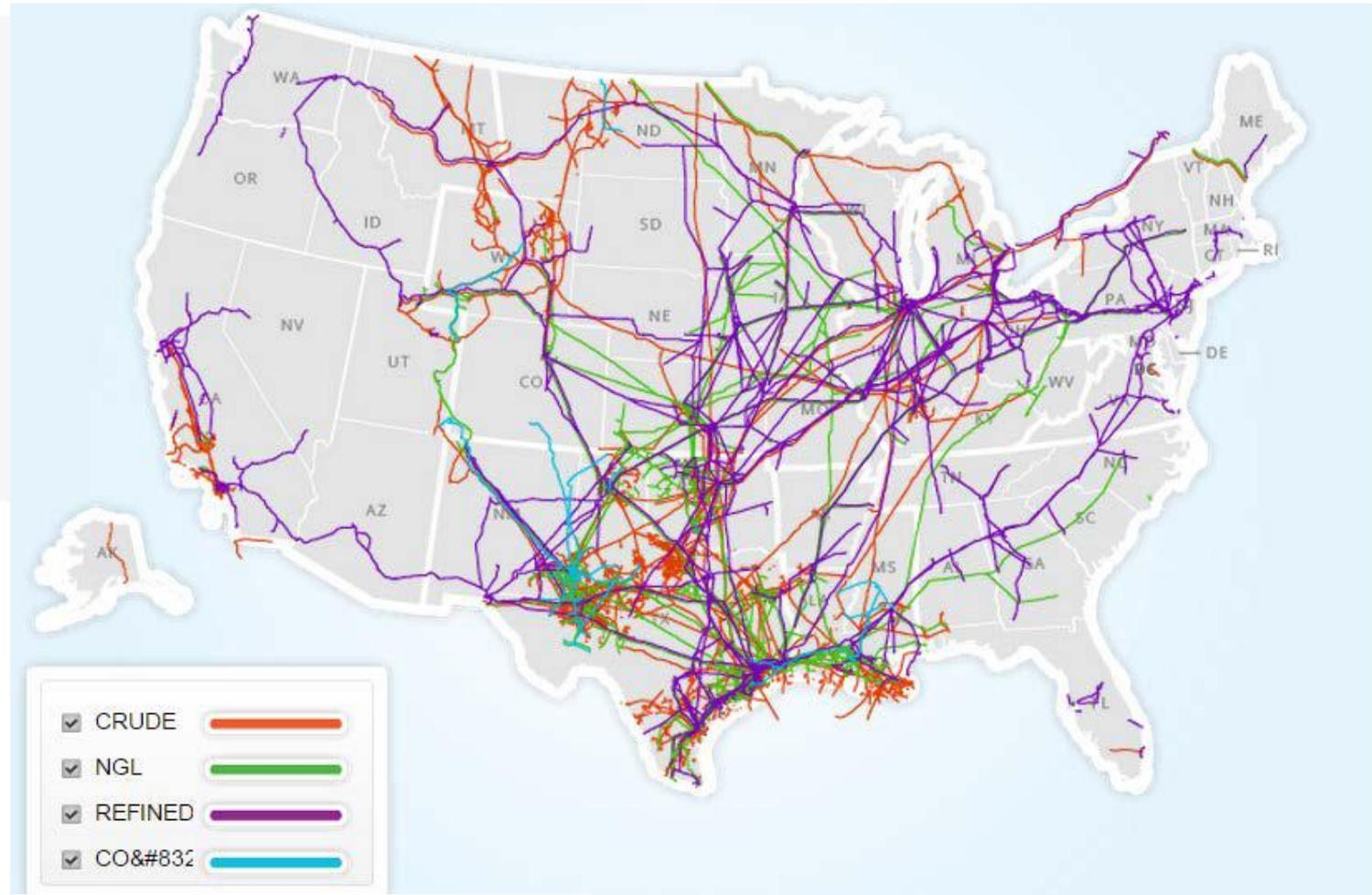
U.S. Petroleum Refinery Capacity

U.S. regional refinery capacity and complexity



Source: EIA

Petroleum Product Pipelines



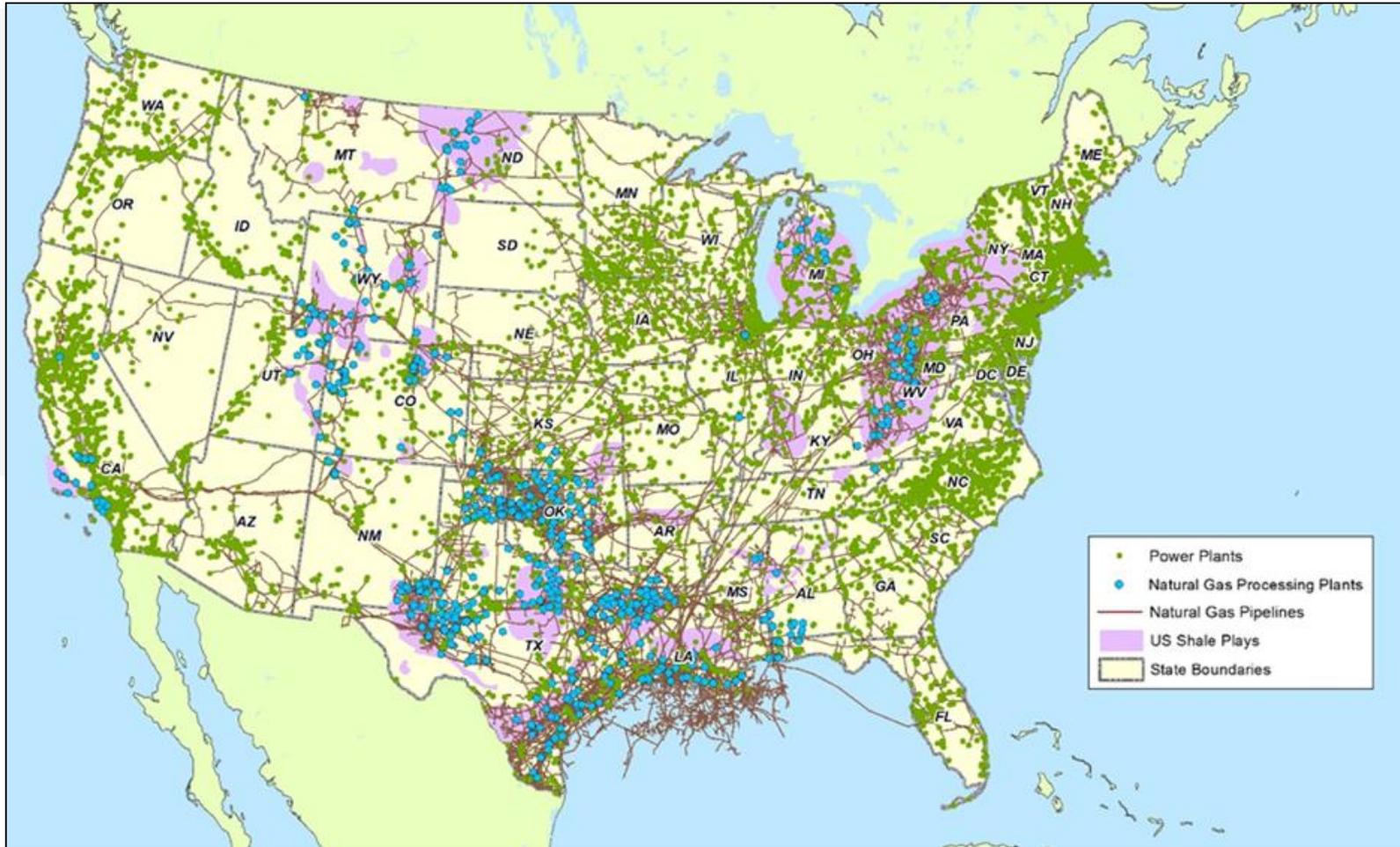
Source: American Energy Mapping, 2013

North American Freight Rail Network



Source: USDOT

US Natural Gas Supply Chain



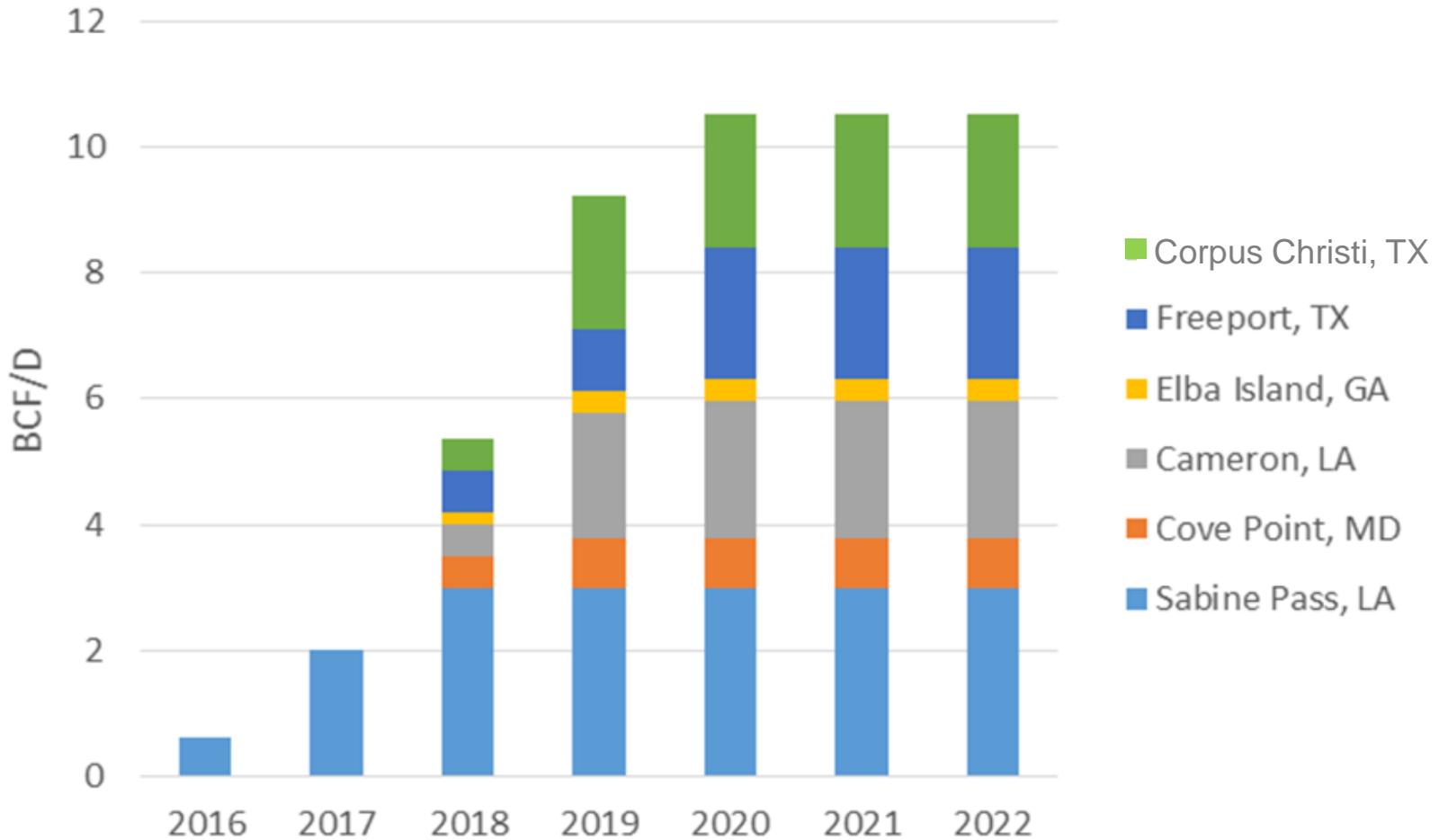
Source: EIA, CS

LNG Truck Movements, 2016 in BCF



Sources: EIA, CS

LNG Exports 2016-2022



Sources: EIA, FERC, CS, RBN

Emerging Markets: LNG Fuel Applications



Sources: Chart Industries, FECR, Tote Marine, CN Railroad, CS

Ethanol Supply Chain

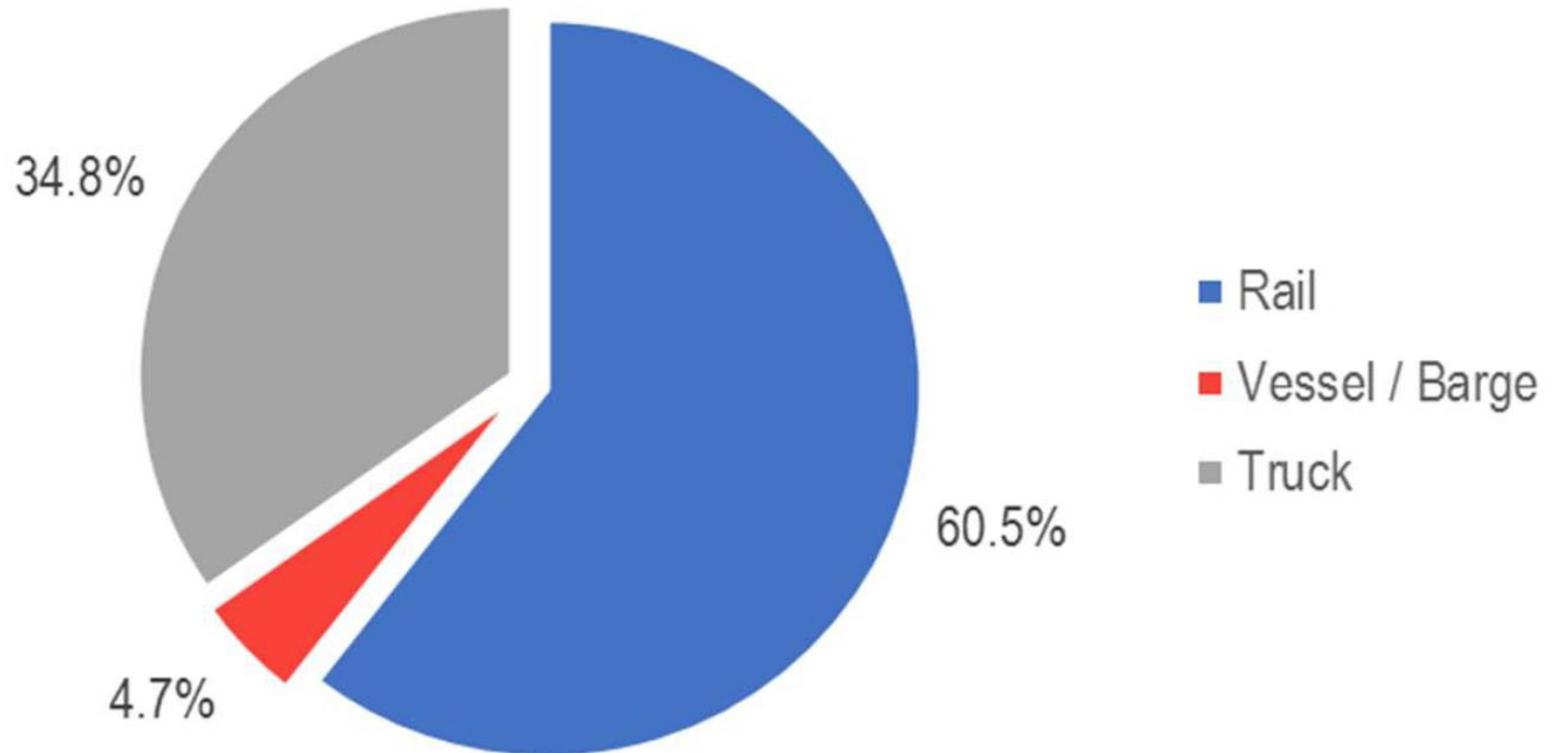
- Most ethanol is produced in the Midwest
- Transported by rail from production facilities to blending facilities
- Transported by truck from blending facilities to distribution stations



http://www.wilco.coop/fuel_services/services/bulk_fuel_delivery/

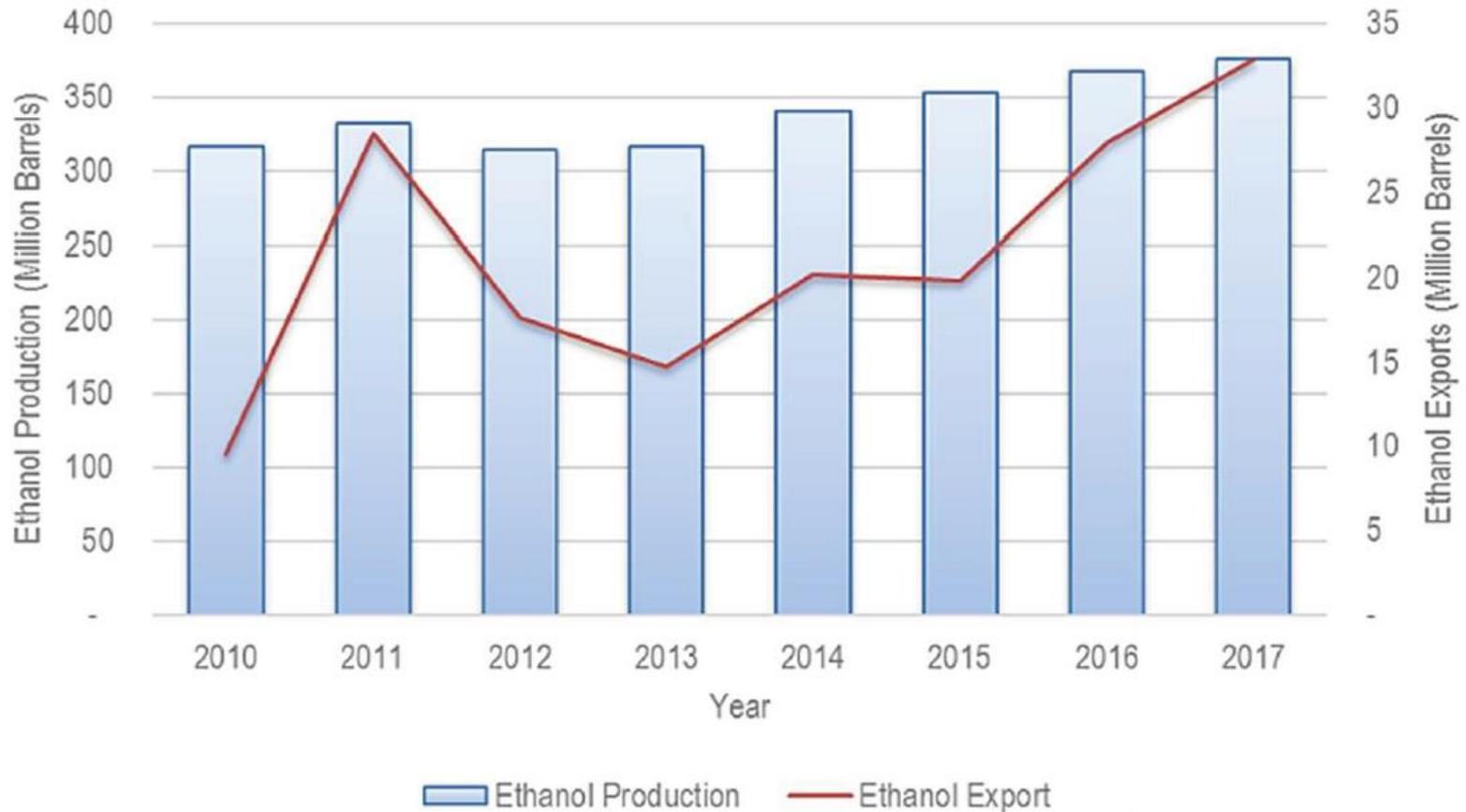
Sources: Wilco Fuel, UP, IEM

U.S. Ethanol Transportation Mode Split



Source: EIA

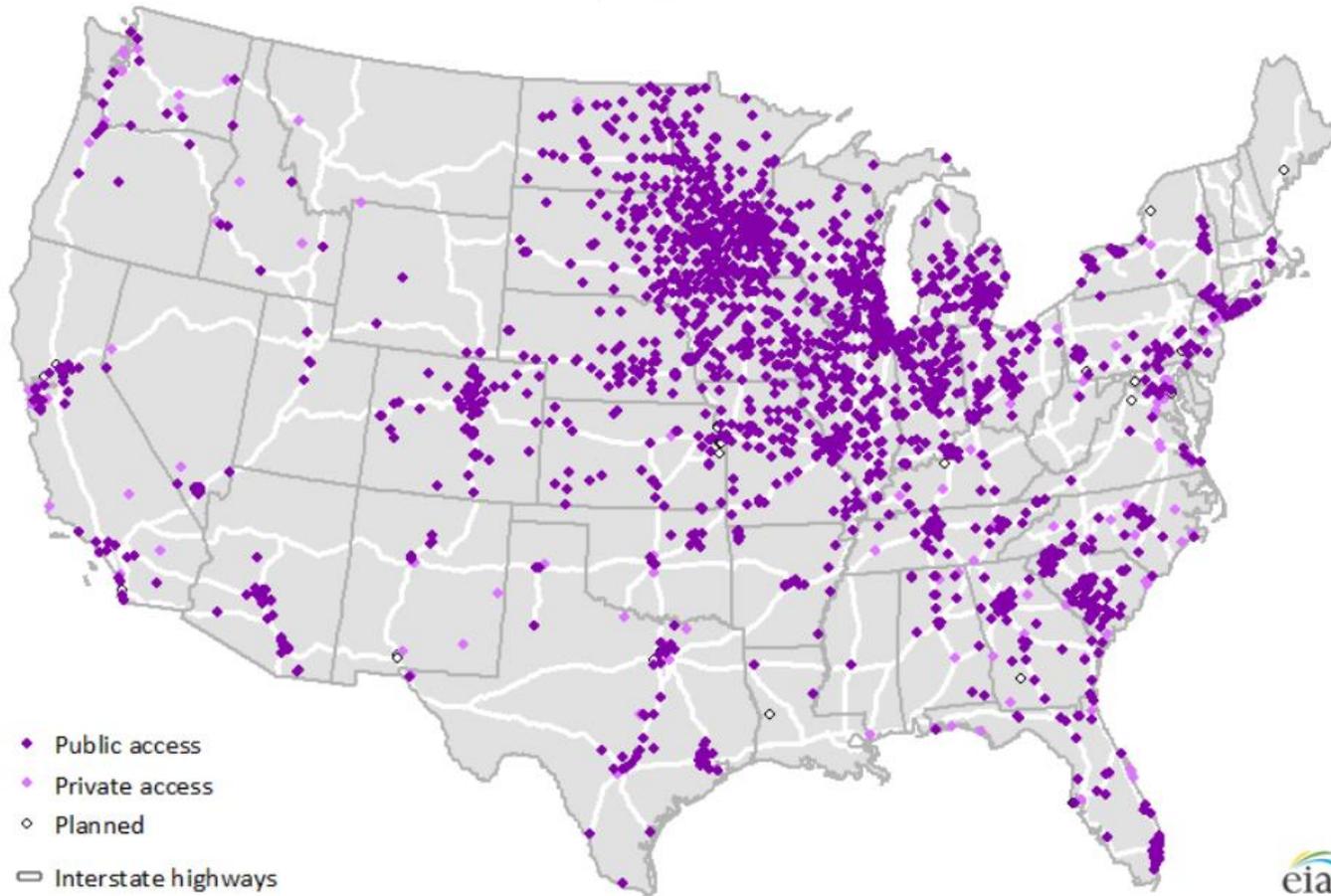
Ethanol Production and Export



Sources: EIA, Renewable Fuel Association, WSP

US Ethanol Fuel Stations

Ethanol (E85) Fuel Stations



Source: EIA

Anhydrous Ammonia Transport

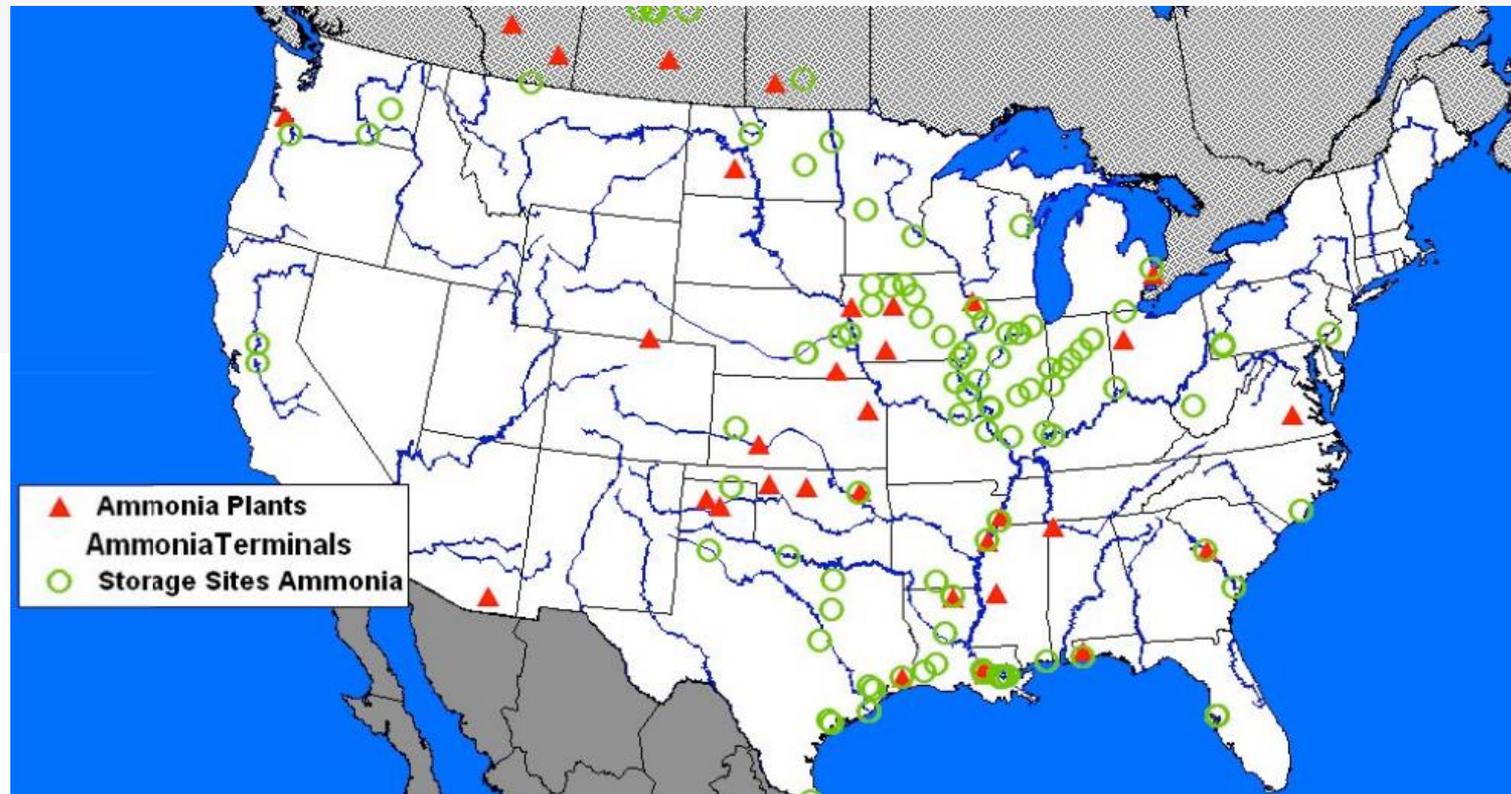
- ISO Containers
- Cargo Trailers
- Railcars
- Ships and Barges
- Pipelines



Sources: Tanner Industries, Maersk, Kirby Barge

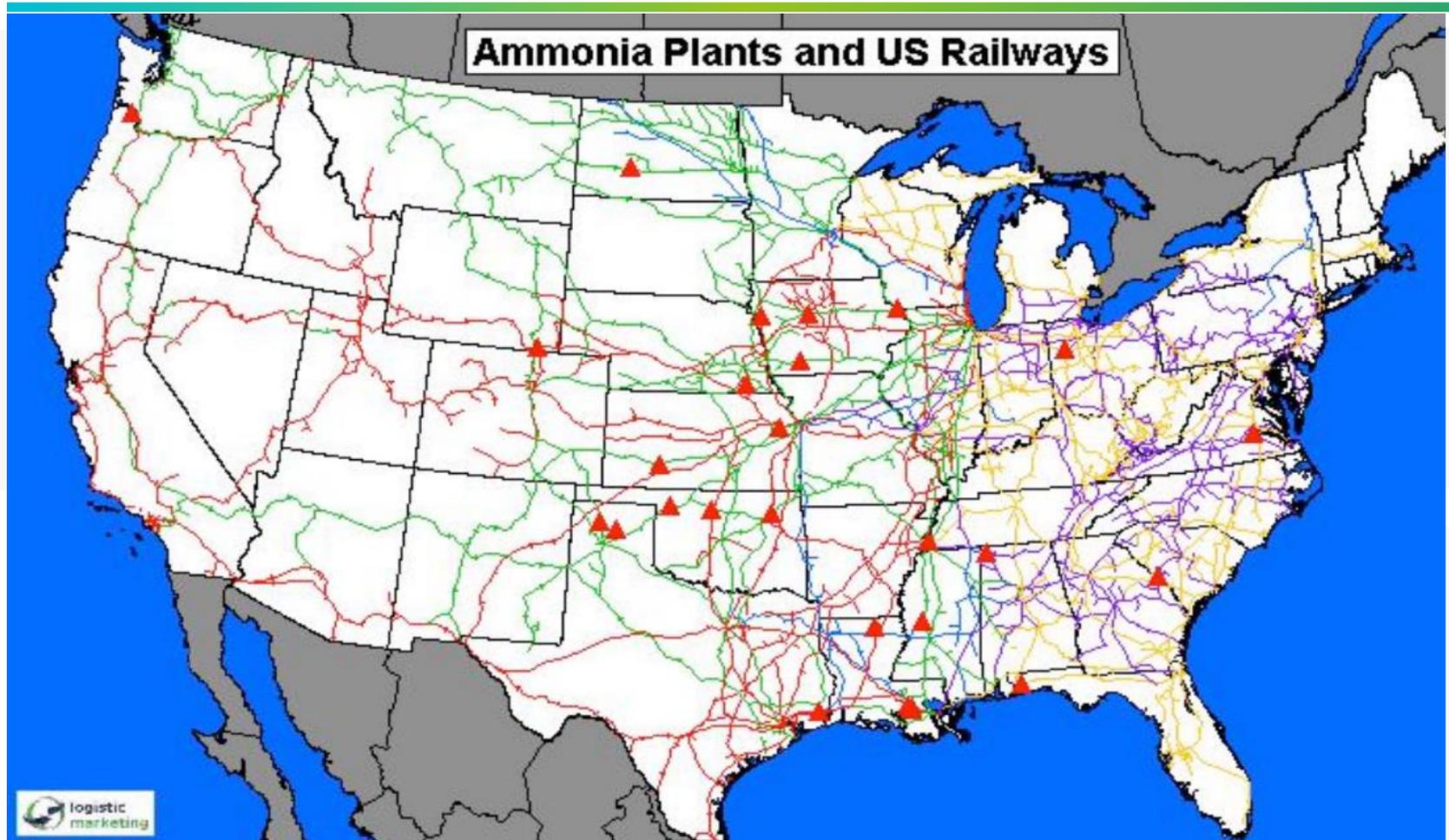
Anhydrous Ammonia Supply Chain

- Ammonia is imported as well as produced in the U.S. primarily as a fertilizer but it is also used as a refrigerant.



Source: Logistic Marketing

Ammonia Distribution in the U.S.



Source: Logistic Marketing

Questions

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